

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/28/21**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 6/28/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

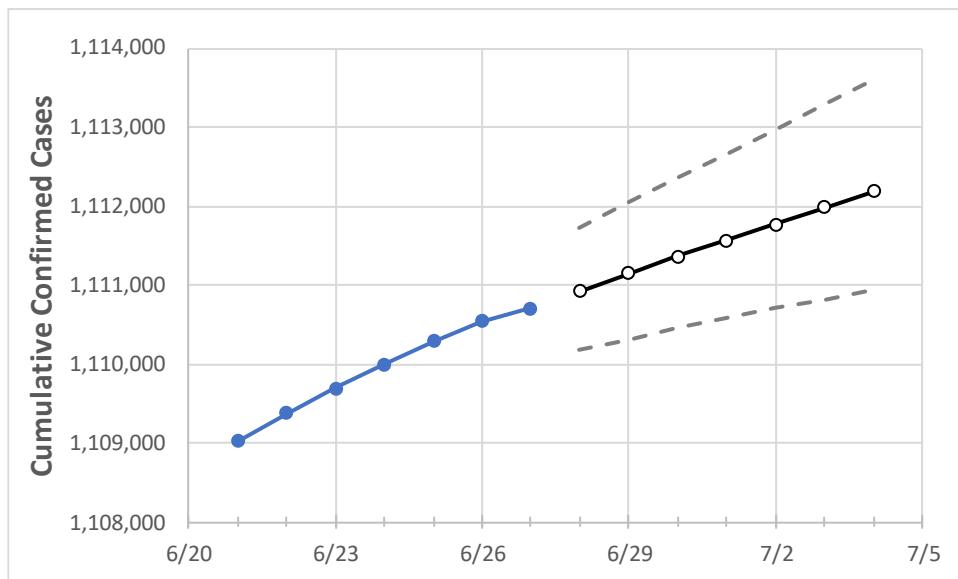
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

Ohio State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	
Ohio	1,110,000	1,110,292	1,110,546	1,110,700	1,110,922	1,111,142	1,111,360	1,111,572	1,111,774	1,111,978	1,112,181	

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

Ohio Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	
Athens	5,245	5,246	5,247	5,249	5,250	5,251	5,252	5,253	5,254	5,255	5,257	
Cuyahoga	115,903	115,939	115,969	115,990	116,011	116,032	116,052	116,071	116,089	116,107	116,124	
Franklin	129,009	129,028	129,060	129,083	129,120	129,157	129,193	129,232	129,269	129,305	129,344	
Hamilton	81,440	81,465	81,477	81,484	81,492	81,500	81,507	81,514	81,521	81,528	81,534	
Lake	21,223	21,227	21,232	21,237	21,243	21,249	21,254	21,259	21,265	21,270	21,276	
Lorain	25,693	25,699	25,705	25,707	25,711	25,715	25,718	25,721	25,724	25,728	25,731	
Lucas	43,387	43,400	43,414	43,415	43,420	43,425	43,429	43,433	43,437	43,441	43,445	
Mahoning	22,392	22,399	22,406	22,409	22,413	22,418	22,422	22,426	22,430	22,433	22,436	
Medina	15,620	15,625	15,628	15,631	15,633	15,635	15,636	15,638	15,640	15,641	15,643	
Miami	10,859	10,862	10,864	10,867	10,869	10,871	10,873	10,874	10,876	10,878	10,880	
Summit	48,463	48,477	48,487	48,491	48,499	48,507	48,514	48,521	48,528	48,534	48,541	

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

Ohio Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases {Hospitalized} [ICU] {Ventilator} For:			
	6/24	6/25	6/26	6/27	6/29	7/1	7/3	
Athens	5,245	5,246	5,247	5,249	5,251 (1,050) [252] {126}	5,253 (1,051) [252] {126}	5,255 (1,051) [252] {126}	
Cuyahoga	115,903	115,939	115,969	115,990	116,032 (23,206) [5,570] {2,785}	116,071 (23,214) [5,571] {2,786}	116,107 (23,221) [5,573] {2,787}	
Franklin	129,009	129,028	129,060	129,083	129,157 (25,831) [6,200] {3,100}	129,232 (25,846) [6,203] {3,102}	129,305 (25,861) [6,207] {3,103}	
Hamilton	81,440	81,465	81,477	81,484	81,500 (16,300) [3,912] {1,956}	81,514 (16,303) [3,913] {1,956}	81,528 (16,306) [3,913] {1,957}	
Lake	21,223	21,227	21,232	21,237	21,249 (4,250) [1,020] {510}	21,259 (4,252) [1,020] {510}	21,270 (4,254) [1,021] {510}	
Lorain	25,693	25,699	25,705	25,707	25,715 (5,143) [1,234] {617}	25,721 (5,144) [1,235] {617}	25,728 (5,146) [1,235] {617}	
Lucas	43,387	43,400	43,414	43,415	43,425 (8,685) [2,084] {1,042}	43,433 (8,687) [2,085] {1,042}	43,441 (8,688) [2,085] {1,043}	
Mahoning	22,392	22,399	22,406	22,409	22,418 (4,484) [1,076] {538}	22,426 (4,485) [1,076] {538}	22,433 (4,487) [1,077] {538}	
Medina	15,620	15,625	15,628	15,631	15,635 (3,127) [750] {375}	15,638 (3,128) [751] {375}	15,641 (3,128) [751] {375}	
Miami	10,859	10,862	10,864	10,867	10,871 (2,174) [522] {261}	10,874 (2,175) [522] {261}	10,878 (2,176) [522] {261}	
Summit	48,463	48,477	48,487	48,491	48,507 (9,701) [2,328] {1,164}	48,521 (9,704) [2,329] {1,165}	48,534 (9,707) [2,330] {1,165}	

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.